CLAIMS

1. An apparatus for providing forced aspiration to an internal combustion engine, the apparatus comprising:

a first displacement device for being driven by exhaust gas from an internal combustion engine to which the apparatus is in use mounted; and,

a second displacement device operable to compress combustion gas for provision to an engine to which the apparatus is in use mounted;

the first and second displacement devices being coupled such that when in use the first displacement device is driven and causes the second displacement device to operate.

2. An apparatus according to claim 1, in which the first and second displacement devices are coupled by a common shaft of rotation.

3. An apparatus according to claim 1 or 2, comprising a drive coupling for coupling the first and/or second displacement device to an engine crank shaft of an engine to which the apparatus is in use mounted.

4. An apparatus according to any preceding claim, in which at least one of the first and second displacement devices comprises a lobed rotor and a recessed rotor arranged such that on rotation of the lobed rotor and the recessed rotor, a lobe from the lobed rotor enters a recess from the recessed rotor to define a variable volume chamber for respectively compression of exhaust gas or expansion of combustion gas.

5. An apparatus according to claim 4, in which the recess and the lobe extend straight in a direction parallel to the axis of rotation of the corresponding rotor.

6. An apparatus according to claim 4, in which the recess and the lobe extend helically in a direction parallel to the axis of rotation of the corresponding rotor.

7. An apparatus according to any of claims 4 to 6, arranged such that the maximum volume of said variable volume chamber can be controlled.

8. An apparatus according to claim 7, comprising a control device associated with at least one of the first and second displacement devices, the control device being controlled in dependence on a feedback signal generated in dependence on an output of the first displacement device to vary the maximum volume of said variable volume chamber of the at least one of the first and second displacement devices.

9. An apparatus according to claim 8, in which each of the first displacement device and the second displacement device comprises a lobed rotor and a recessed rotor arranged such that on rotation of the lobed rotor and the recessed rotor, a lobe from the lobed rotor enters a recess from the recessed rotor to define a variable volume chamber

10. An apparatus according to claim 9, in which both of the first and second displacement devices has a corresponding control device attached thereto.

11. An apparatus according to any of claims 8 to 10, comprising a pressure sensor mounted on an input to the first displacement device to detect a pressure at the input to the first displacement device and provide a signal in dependence thereon for controlling the or each control device.

12. An apparatus according to any of claims 8 to 11, comprising a pressure sensor mounted on an output of the second displacement device to detect a pressure of combustion gas output from the second displacement device and provide a signal in dependence thereon for controlling the or each control device.

13. An apparatus according to claim 11 or 12, comprising a controller arranged to receive the signal from the pressure sensor and provide a control signal to the or each control device to control the maximum possible volume of the respective variable volume chamber.

14. An internal combustion engine, the engine comprising:

one or more swept volume chambers for receiving a fuel and air mixture;

an apparatus for providing forced aspiration to the swept volume chambers, the apparatus comprising an expander to receive exhaust gas from the engine and a compressor driven by the expander to compress air for provision to the one or more swept volume chambers,

wherein the expander and the compressor are each displacement devices.

15. An engine according to claim 14, wherein the expander and the compressor are connected by a common shaft of rotation.

16. An engine according to claim 14, wherein the common shaft of rotation is connected to an output shaft of the engine in such a way as to be able selectively to provide a driving force to the engine output shaft and to receive a driving force therefrom.

17. An engine having an apparatus mounted thereon, the apparatus being for providing forced aspiration to the engine, the apparatus comprising:

an expander to be driven by exhaust gas from one or more swept volume chambers of the engine; and,

a compressor to be driven by the expander to compress air for provision to the one or more swept volume chambers of the engine,

wherein a connection is provided between the apparatus and the engine output shaft to enable power to be taken from the engine to drive the compressor when insufficient exhaust gas to drive the expander is generated by the engine and to provide power to the engine output shaft from the apparatus when sufficient exhaust gas is generated.

18. An engine according to any of claims 14 to 17, in which at least one of the first and second displacement devices comprises a lobed rotor and a recessed rotor arranged such that on rotation of the lobed rotor and the

recessed rotor, a lobe from the lobed rotor enters a recess from the recessed rotor to define a variable volume chamber for respectively compression of exhaust gas or expansion of combustion gas.